Spot Safety Project Evaluation

Project Log # 200703086

Spot Safety Project # 03-02-211

Spot Safety Project Evaluation of the Traffic Signal Installation the Intersection of US 17 (Ocean Hwy) and SR 1304/1165 (Pea Landing/Thomasboro Rd)
Brunswick County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 7/25/2008
Brad Robinson, EI Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-02-211 – The Intersection of US 17 (Ocean Hwy) and SR 1304/1165 (Pea Landing/Thomasboro Rd) in Brunswick County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install a traffic signal. The subject location is a four-leg intersection which was controlled by stop signs on SR 1304/1165 in the before period. US 17 is a divided multi-lane highway with two through lanes, one left turn lane, and one right turn lane with a slip ramp on each approach. In the before period the approaches of SR 1304/1165 had median islands with dual stop signs. In the after period the islands were removed and right turn lanes were added. The speed limits are 55 mph for US 17 and 45 mph for SR 1304/1165.

The original investigation revealed existing crash patterns involving motorists attempting to turn left from SR 1304 or SR 1165 onto US 17. A school was also opening near the intersection and the signal was requested by the division engineer, the local school board, county commissioners, and sheriff .

The initial crash analysis was conducted from February 1, 1999 to January 31, 2002 with a total of 20 crashes, 14 of which were considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on November 23, 2002 with a total cost of $120,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from November 1, 2002 to December 31, 2002. The before period consisted of reported crashes from December 1, 1997 through October 31, 2002 (4 years and 11 months) and the after period consisted of reported crashes from January 1, 2003 through November 30, 2007 (4 years and 11 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the chosen countermeasure. The crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	30	33	10.0
Total Severity Index	10.74	5.54	-48.4
Target Crashes	25	18	-28.0
Target Crash Severity Index	11.5	8.5	-26.1
Volume	17,900	19,600	9.5
Crash Severity Summary			
Fatal Crashes	2	0	-100.0
Class A Crashes	0	1	N/A
Class B Crashes	8	5	-37.5
Class C Crashes	11	5	-54.5
PDO Crashes	9	22	144.4

The naive before and after analysis at the treatment location resulted in a 10 percent increase in Total Crashes, a 28 percent decrease in Target Crashes, and a 10 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 10 percent increase in Total Crashes and a 28 percent decrease in Target Crashes. The Total Severity Index decreased by 48 percent and the Target Crash Severity Index decreased by 26 percent. The summary results above demonstrate that although Total Crashes appear to have increased, Target Crashes appear to have decreased at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is 3.23 considering total crashes. The benefit to cost ratio considering only target crashes is 3.28. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Referencing the *Collision Diagrams*, it is apparent that the installation of the traffic signal significantly reduced the existing crash patterns. Frontal Impact Crashes between SR 1304 vehicles and westbound US 17 vehicles reduced 86% (from 7 to 1), between SR 1304 vehicles and eastbound US 17 vehicles the reduction was 100% (4 to 0), between SR 1165 vehicles and eastbound US 17 vehicles the reduction was 63% (from 8 to 3), and between SR 1165 vehicles and westbound US 17 vehicles the reduction was 100% (from 3 to 0).

Although the existing crash patterns were reduced or eliminated from the before to the after period, after the signal was installed new Frontal Impact Crash patterns developed at the intersection. Left

Turn-Same Roadway Crashes involving vehicles turning left onto SR 1165 increased 233% (from 3 to 10), while Left Turn-Same Roadway crashes involving vehicles turning left onto SR 1304 increased from zero in the before period to four in the after. The signal phasing allows for protected/permitted left turns, although the majority of these crash types appear to have occurred during the permitted phase (the through vehicle was only faulted in two of these crashes).

A pattern of rear-end crashes has also developed on US 17 involving vehicles approaching the intersection (0 to 8).

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 17 and SR 1304/1165 BY: Brad Robinson
COUNTY: Brunswick DATE: 7/2/2008
FILE NO.: SS 03-02-211

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$120,000	10	0.149	$17,884
Right-of-Way	$0	0	0.000	$0
TOTALS	$120,000	10	0.149	$17,884

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $22,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $40,784
TOTAL COST OF PROJECT= $120,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.92	2	0.41	19	3.86	9	1.83	$296,321
AFTER	4.92	1	0.20	10	2.03	22	4.47	$164,675

Annual Benefits from Crash Cost Savings $131,646

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $90,863

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 3.23

TOTAL COST OF PROJECT - $120,000 COMPREHENSIVE B/C RATIO - 3.23

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 17 and SR 1304/1165 BY: Brad Robinson
COUNTY: Brunswick DATE: 7/2/2008
FILE NO.: SS 03-02-211 Target

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$120,000	10	0.149	$17,884
Right-of-Way	$0	0	0.000	$0
TOTALS	$120,000	10	0.149	$17,884

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $22,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $40,784
TOTAL COST OF PROJECT= $120,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.92	2	0.41	15	3.05	8	1.63	$280,041
AFTER	4.92	1	0.20	8	1.63	9	1.83	$146,118

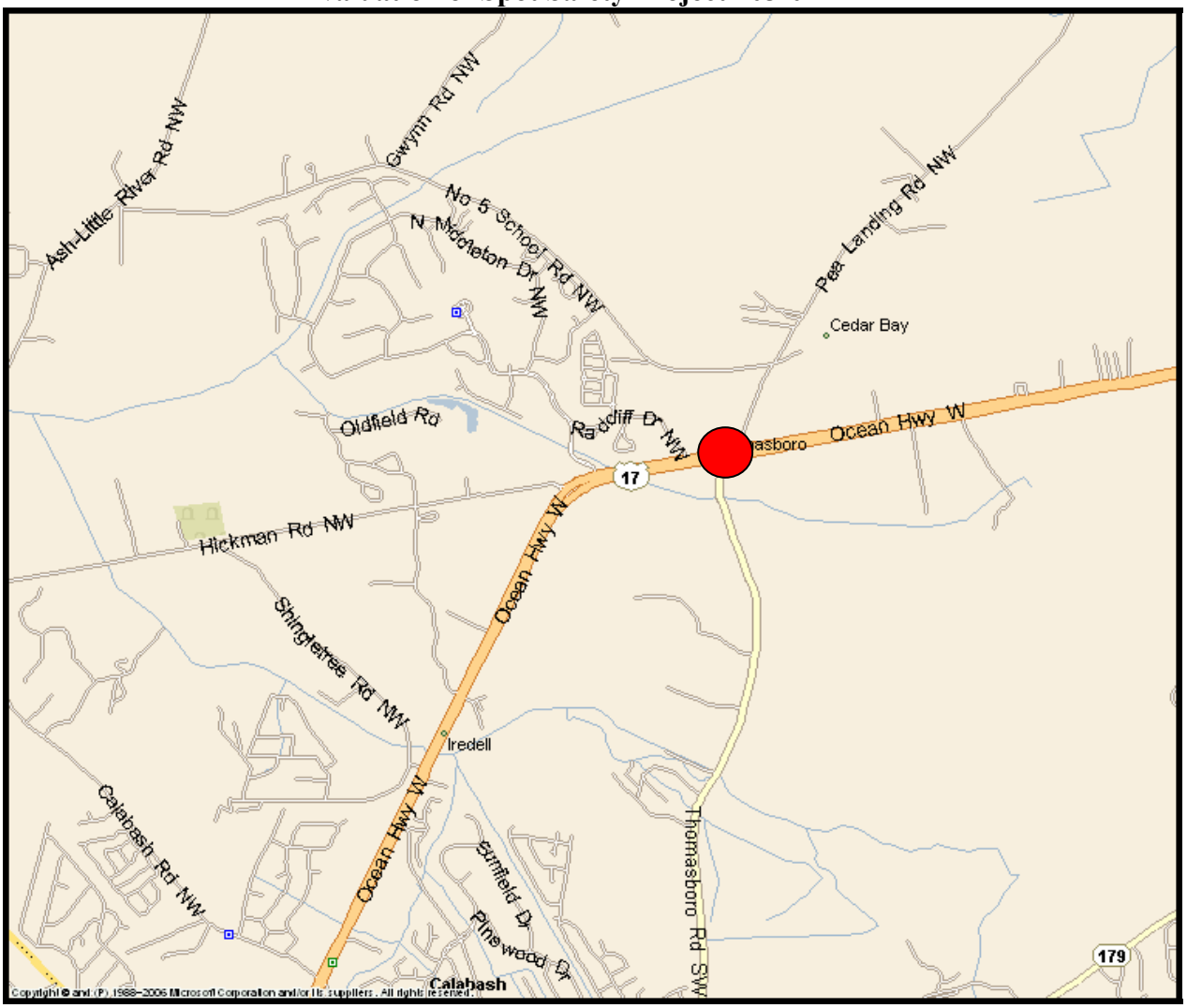
Annual Benefits from Crash Cost Savings $133,923

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $93,139

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 3.28

TOTAL COST OF PROJECT - $120,000 COMPREHENSIVE B/C RATIO - 3.28

Location Map
Brunswick County
Evaluation of Spot Safety Project #03-02-211



Treatment Location: US 17 (Ocean Hwy) at SR 1304/1165 (Pea Landing/Thomasboro Rd)

Treatment Site Photos Taken May 14, 2008

Traveling Eastbound on US 17 (Ocean Hwy)

Traveling Eastbound on US 17 (Ocean Hwy)

Traveling Westbound on US 17 (Ocean Hwy)

Traveling Westbound on US 17 (Ocean Hwy)

Traveling Southbound on SR 1304 (Pea Landing Rd)

Traveling Southbound on SR 1304 (Pea Landing Rd)

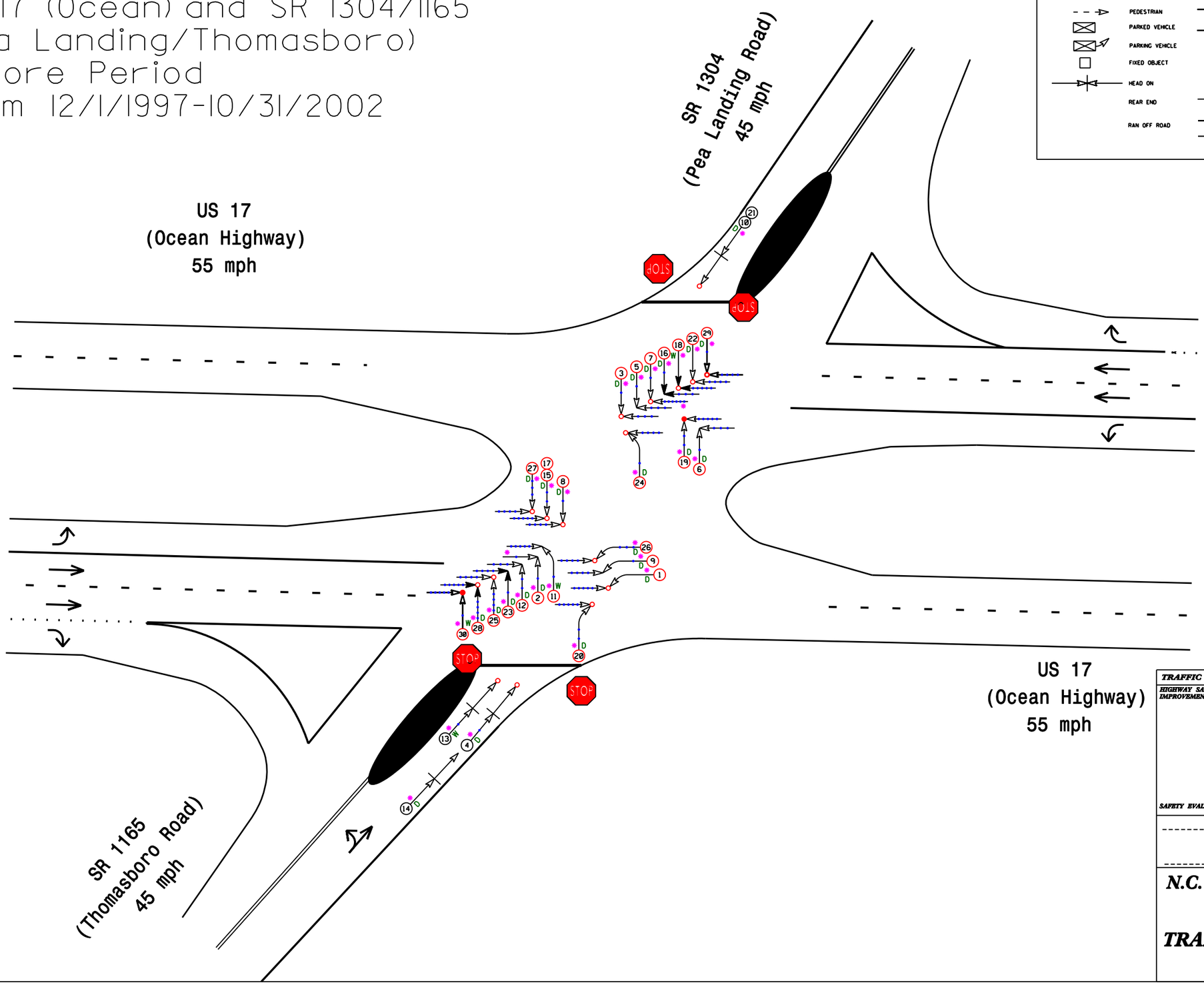
Traveling Northbound on SR 1165 (Thomasboro Rd)

Traveling Northbound on SR 1165 (Thomasboro Rd)

Brunswick County
US 17 (Ocean) and SR 1304/1165 (Pea Landing/Thomasboro)
Before Period
From 12/1/1997-10/31/2002

LEGEND

MOVING VEHICLE	ANGLE	9 MPH OR LESS	P	PEDESTRIAN
PEDESTRIAN		10 MPH TO 19	B	BICYCLE
PARKED VEHICLE	TURNING	20 MPH TO 29		
PARKING VEHICLE	BACKING	30 MPH TO 39	T	TRAIN
FIXED OBJECT		40 MPH TO 49	A	ANIMAL
HEAD ON	SIDESWIPE	50 MPH TO 59		
REAR END	OUT OF CONTROL	60 MPH TO 69	•	DRIVER AT FAULT
RAN OFF ROAD	INJURY	70 AND UP	D	DRY
	FATALITY	SPEED UNKNOWN	W	WET
		DAYLIGHT CRASH		
		DARK CRASH	I	ICY OR SNOWY

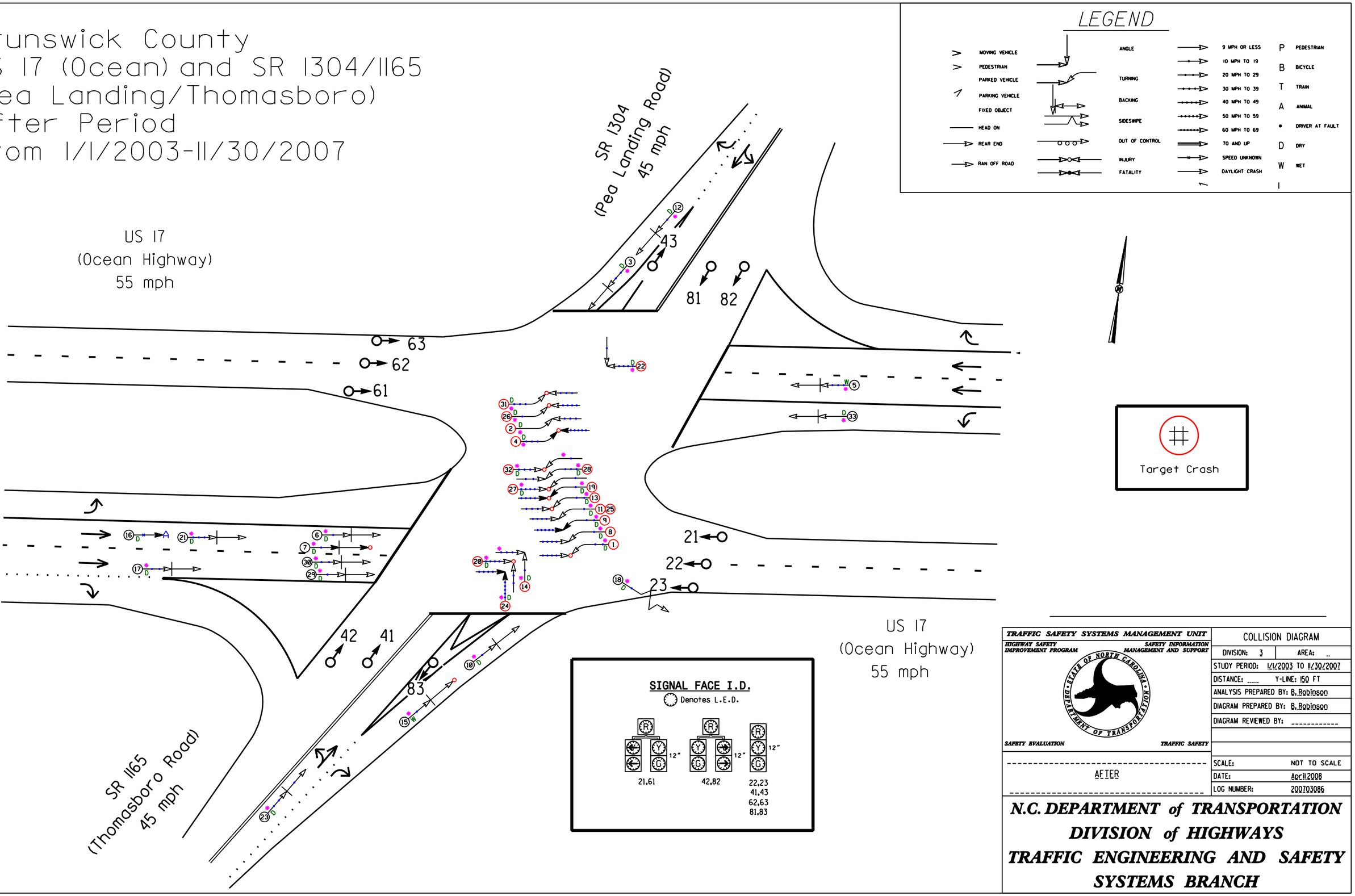


Target Crash

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	COLLISION DIAGRAM
HIGHWAY SAFETY IMPROVEMENT PROGRAM / SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION: 3 AREA: ..
	STUDY PERIOD: 12/1/1997 TO 10/31/2002
	DISTANCE: ..... Y-LINE: 150 FT
	ANALYSIS PREPARED BY: B.Robinson
	DIAGRAM PREPARED BY: B.Robinson
	DIAGRAM REVIEWED BY: _____
SAFETY EVALUATION / TRAFFIC SAFETY	
BEFORE	SCALE: NOT TO SCALE
	DATE: April 2008
	LOG NUMBER: 200703086

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

Brunswick County
US 17 (Ocean) and SR 1304/1165
(Pea Landing/Thomasboro)
After Period
From 1/1/2003-11/30/2007



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY IMPROVEMENT PROGRAM | SAFETY INFORMATION MANAGEMENT AND SUPPORT

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

SAFETY EVALUATION | TRAFFIC SAFETY

AFTER

COLLISION DIAGRAM

DIVISION: 3	AREA: ..
STUDY PERIOD:	1/1/2003 TO 11/30/2007
DISTANCE:	Y-LINE: 150 FT
ANALYSIS PREPARED BY:	B.Robinson
DIAGRAM PREPARED BY:	B.Robinson
DIAGRAM REVIEWED BY:	----------
SCALE:	NOT TO SCALE
DATE:	April 2008
LOG NUMBER:	200703086

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH